

Seafood Cold Storage: Simulation Modeling for Planning

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Background

- Value of West Coast seafood landings have been falling
- West coast communities are losing processors and shoreside support businesses – bankruptcy and consolidation
- Northwest processing capacity is largely dominated by a single firm
- NW coastal communities tend to be fairly remote and rural with natural resource and tourism based economies

Why are coastal communities interested in cold storage?

- More community control of shoreside seafood activity
- Support seafood infrastructure development & stop hemorrhaging of existing industry
- Hedge against market fluctuation
- Encourage development of cold storage-related business
 - Is cold storage a “keystone” piece of infrastructure in coastal communities?

Range of interest in cold storage development

Several parties have expressed interest including:

- A large cold store owned and operated by a port authority
- A small cold store servicing a value-added seafood processor
- A mid-scale regional facility that would serve a fishermen's cooperative
- A large cold store servicing the at-sea processing fleet

What major concepts are associated with seafood based cold store development?

- Cold store construction and operation exhibits a pattern of scale economies
- Seafood requires lower holding temperatures than terrestrial-based forms of food inventory– this increases cost
- Seafood as a source of inventory presents several challenges:
 1. Unstable harvest volumes from year to year (many fish stocks are highly variable)
 2. Fishing seasons are often characterized by brief and concentrated harvest periods – may result in idle cold store capital for much of the year
 - On the west coast, the two largest volume fisheries are highly unstable and have relatively brief harvest periods. Creates a perplexing tradeoff of economies to scale, average annual occupancy rate, and uncertainty about the future

...Development challenges continued

The coast region is fairly remote

- Removed from major transportation networks
- Difficulties in diversifying inventory
- Significant cold storage exists along the I-5 corridor

A Simulation Model for Planning Coastal Cold Storage

Description and Objective: A model designed to encourage community involvement and facilitate more community control and understanding over potential cold storage development.

- Designed to be useful for a wide audience that may have multiple objectives in cold storage development
- Model uses an iterative process to explore coastal cold storage development alternatives

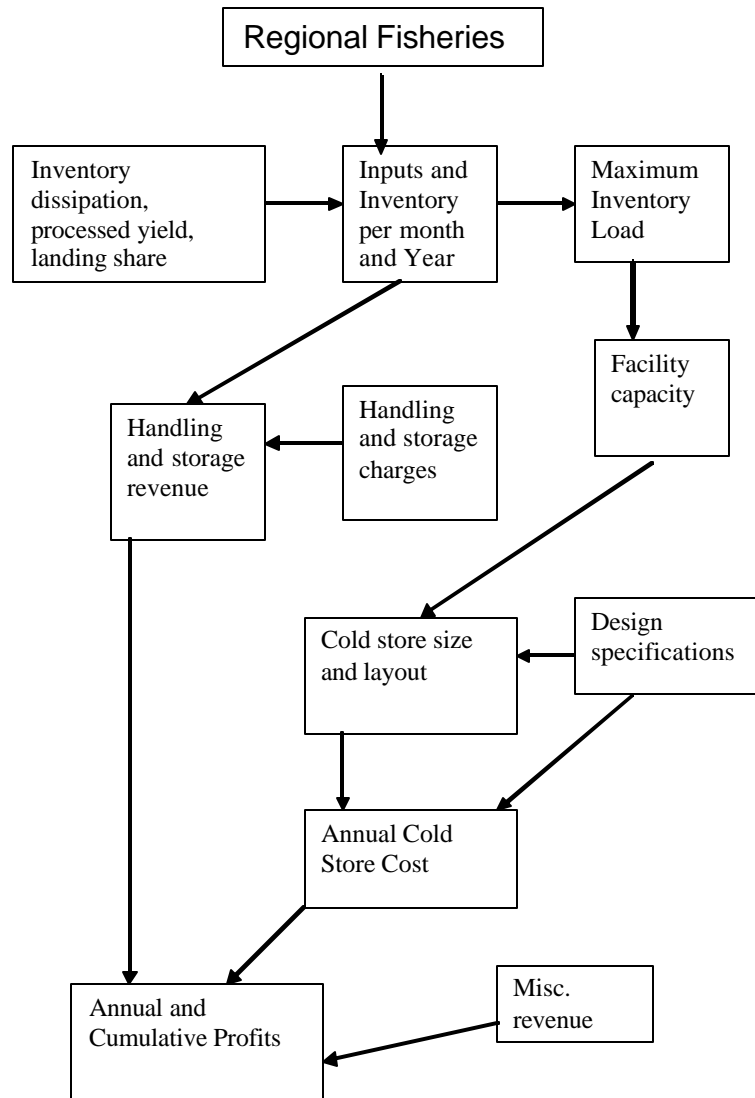
Information to assist the user in planning seafood based cold storage is provided on the following variables:

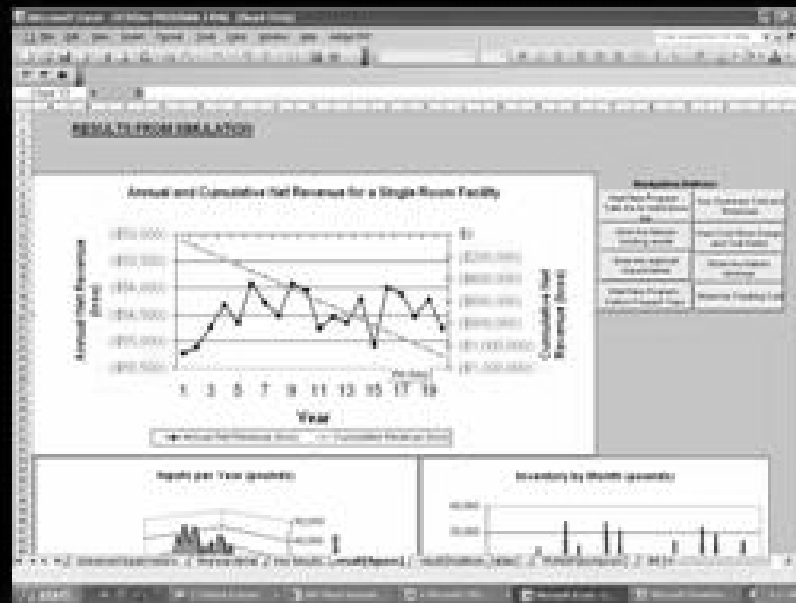
- Revenues
- Capital and Operating Costs
- Net Revenues
- Regional Impacts
- Supporting Data and Analysis

Simulation Model Description

Model combines information on fish stock productivity, variability, and monthly patterns in catch, with cold store development costs and design elements

- Uses a set of regression functions in combination with various expectations for estimating costs
- Estimates revenues based on a series of expectations regarding demand and pricing schedules, in conjunction with fishery information
- Estimates cold store dimensions based on several variables including demand, peak load, inventory dissipation and product density





Screen shot of Interface and Outputs in Model

Review of Community Simulations

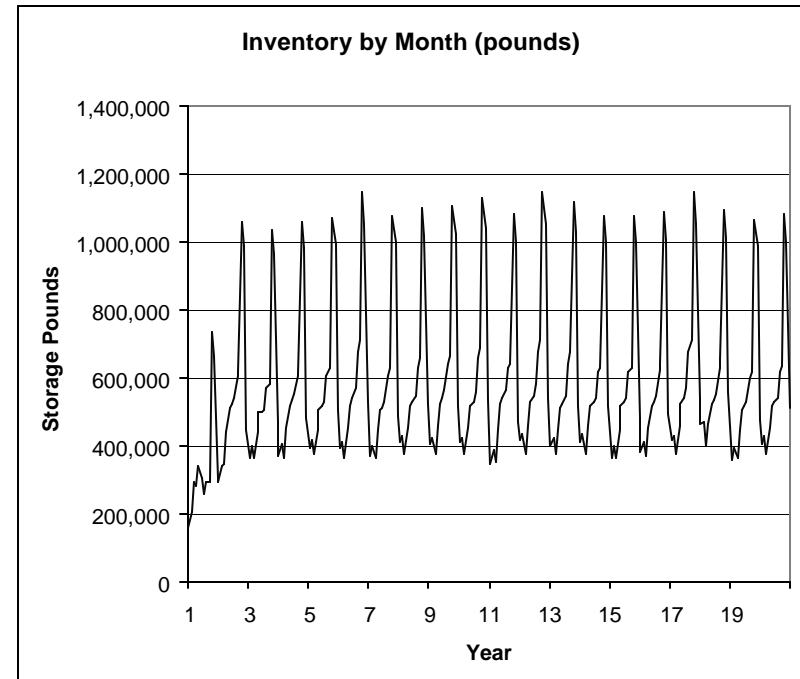
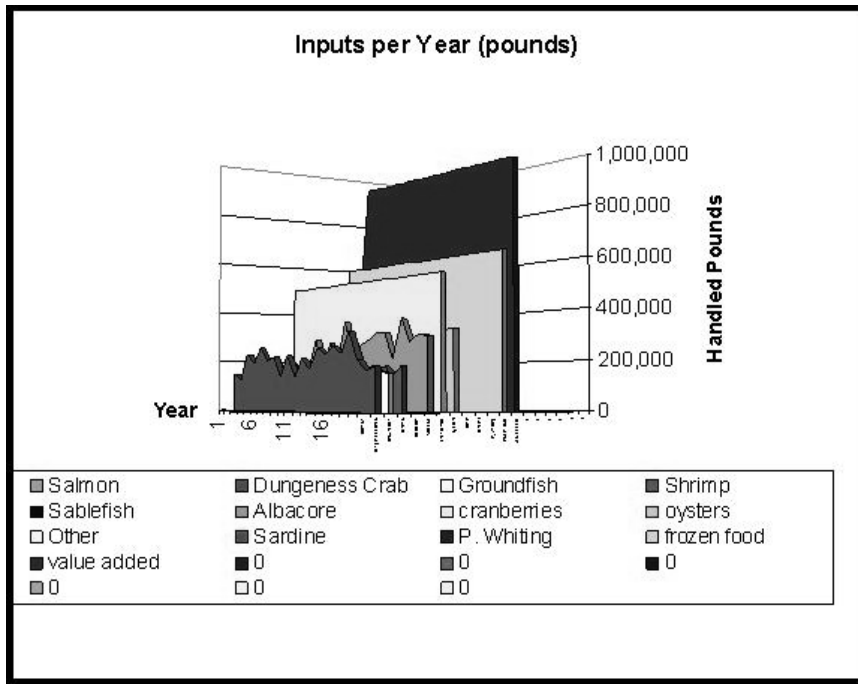
Value-Added Seafood Processor in Astoria

Processor that would focus on using locally caught salmon, albacore, crab for value added products

Views cold storage as a means of spreading processing throughout the year, hedging against markets, and providing logistical requirements

Processor envisioned a publicly available facility where he was the primary user

Predicted Inventory for Value added Case Study



Cost and Dimensions for Value Added Case Study

SUMMARY RESULTS FROM SIMULATION

	Height	Floor Area
Building Dimensions	10	18,686

	Predicted	Low Estimate	High Estimate
<u>Building Capital Cost</u>	\$1,223,268	\$987,625	\$1,463,546
<u>Other Capital Cost</u>	\$163,738	\$154,134	\$173,343
<u>Total Capital Cost</u>	\$1,387,007	\$1,141,760	\$1,636,888

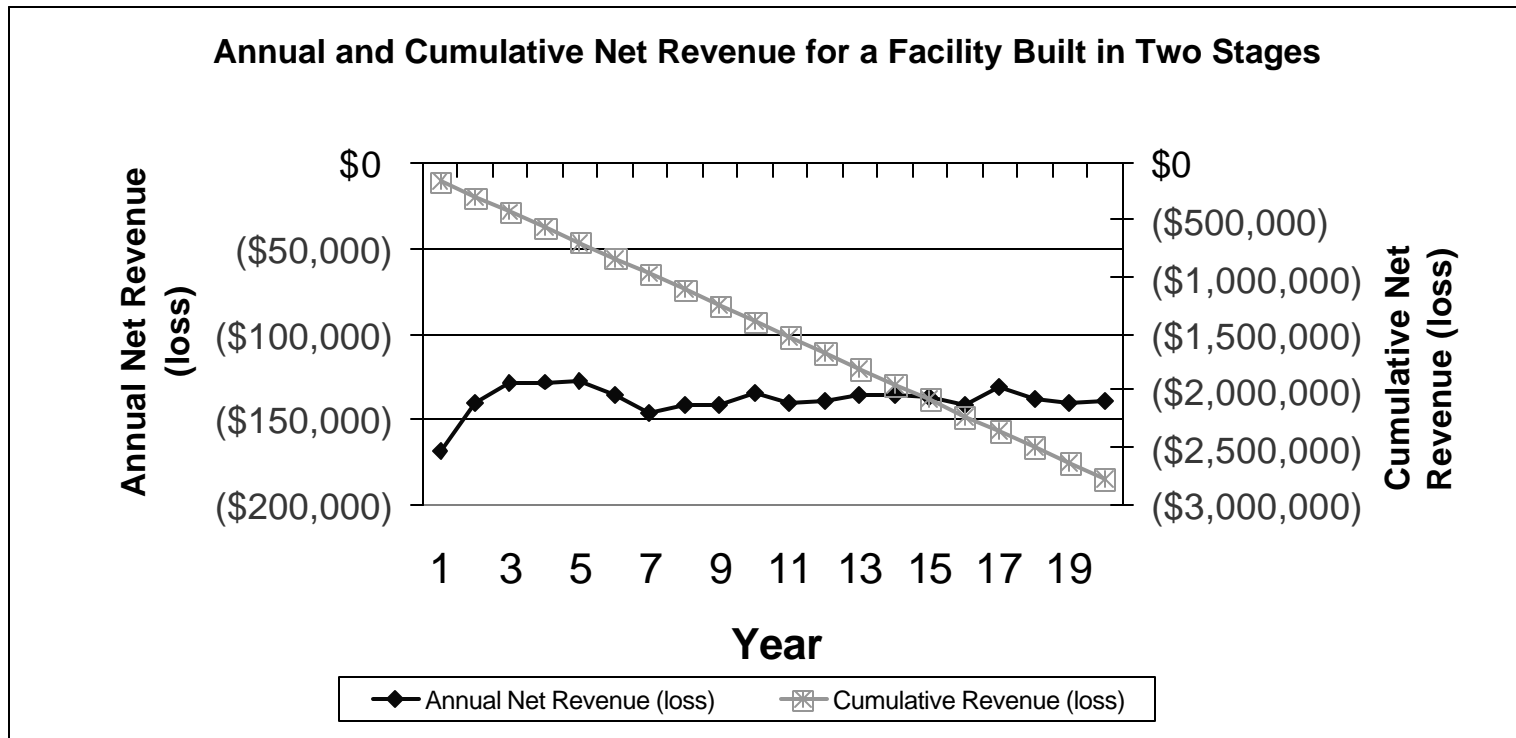
Duration of Loan repayment (years)	Loan percentage Rate	Annual loan payment of total predicted capital cost
20	0.06	(\$120,925.57)

Annual Cost of Refrigeration Energy	(\$24,532.23)
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Annual Labor Cost	(\$30,000.00)
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Annual Misc. Costs	(\$56,125.58)
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Predicted Revenue (loss) for Value Added Case Study



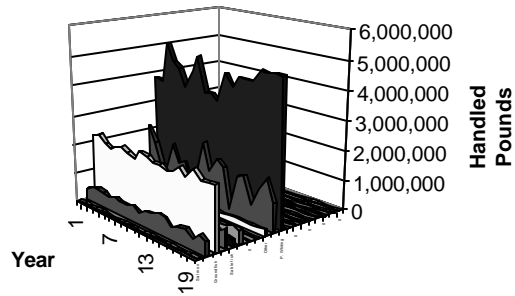
Port Facilitated Cold Store in Astoria

Port representatives viewed cold storage as having the potential to act as a catalyst for growth in the maritime sectors

Large scale facility that would cater to local fisheries, agriculture, and ship traffic along Columbia river

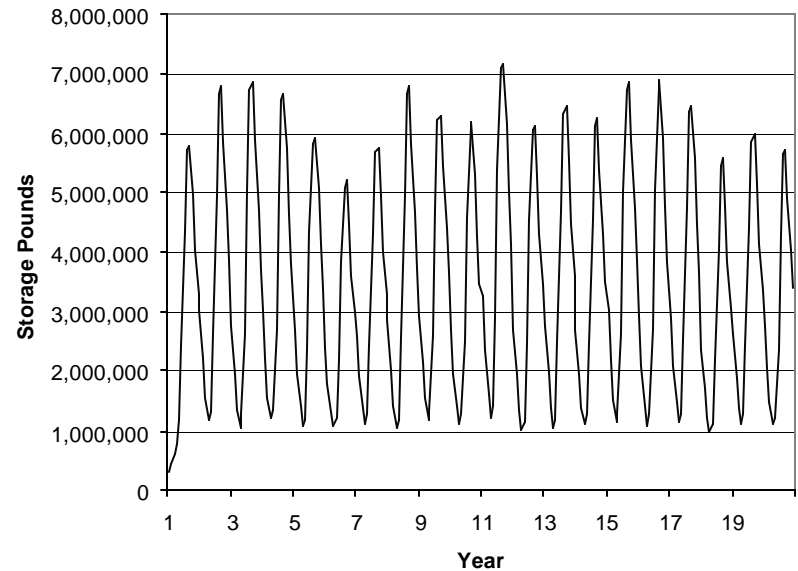
Predicted Inventory for Port of Astoria Case Study

Inputs per Year (pounds)



Salmon	Dungeness Crab	Groundfish	Shrimp
Sablefish	Albacore	0	0
Other	Sardine	P. Whiting	0
0	0	0	0
0	0	0	0

Inventory by Month (pounds)



Cost and Dimensions for Port of Astoria Case Study

SUMMARY RESULTS FROM SIMULATION

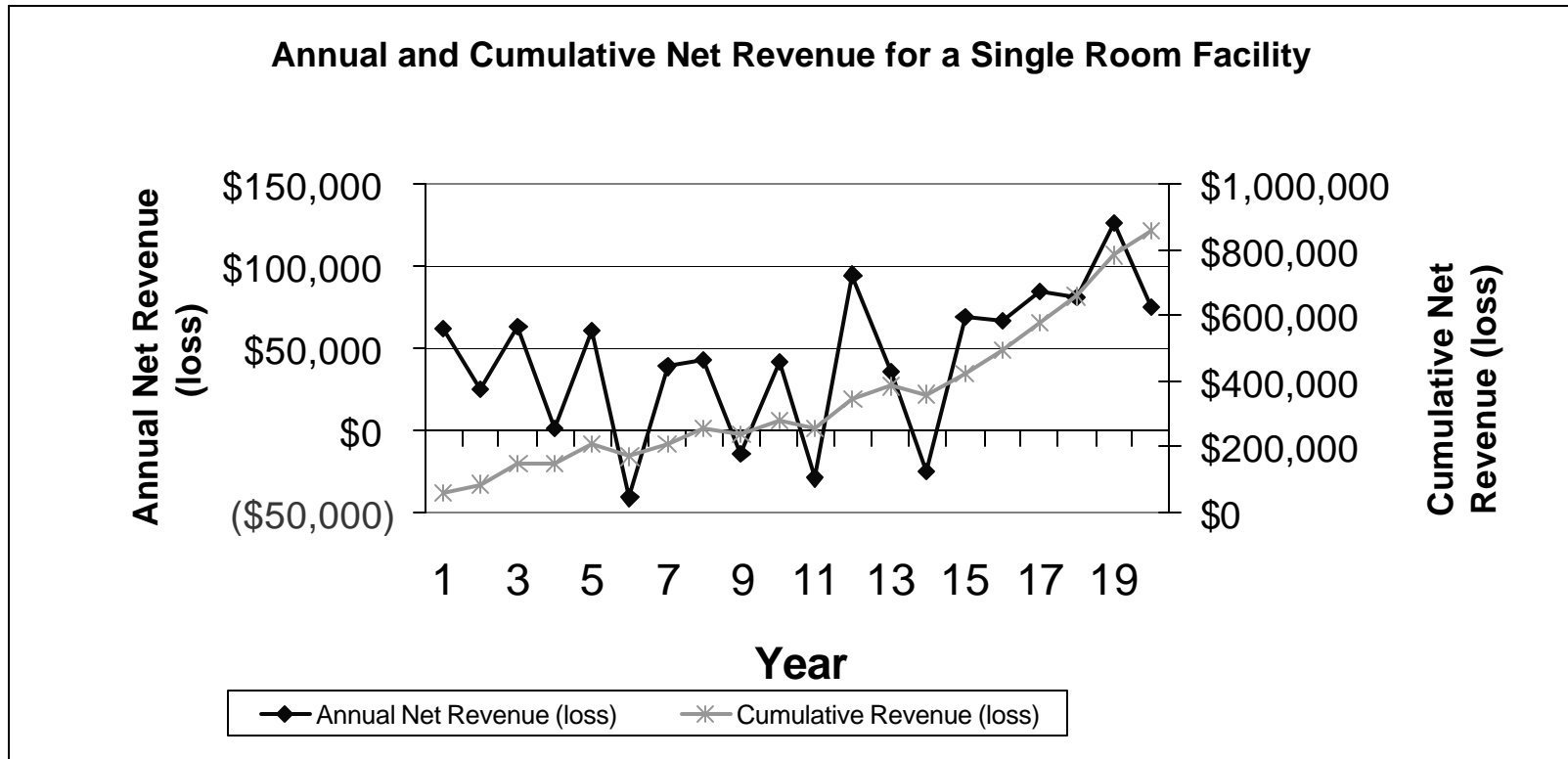
	Height	Floor Area
Building Dimensions	30	36,755

	Predicted	Low Estimate	High Estimate
Building Capital Cost	\$3,628,312	\$2,315,178	\$4,967,671
Other Capital Cost	\$375,028	\$319,476	\$430,581
Total Capital Cost	\$4,003,340	\$2,634,654	\$5,398,253

Duration of Loan repayment (years)	Loan percentage Rate	Annual loan payment of total predicted capital cost
20	0	(\$349,029.43)

Annual Cost of Refrigeration Energy	(\$48,589.10)
Annual Labor Cost	(\$180,000.00)
Annual Misc. Costs	(\$166,113.58)

Predicted Revenue (loss) for Port of Astoria Case Study



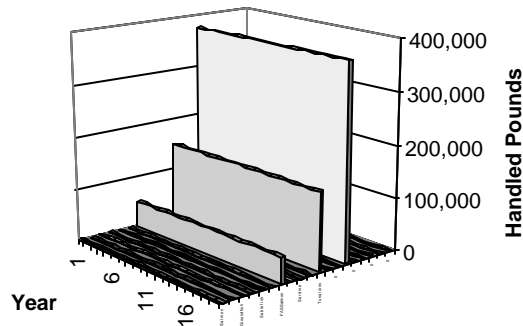
Small Scale Processor in Newport

Processor sees cold storage as easing logistical needs and providing low-temperature requirements needed for her product

Currently stores product out of state and incurs high transportation costs and time for travel

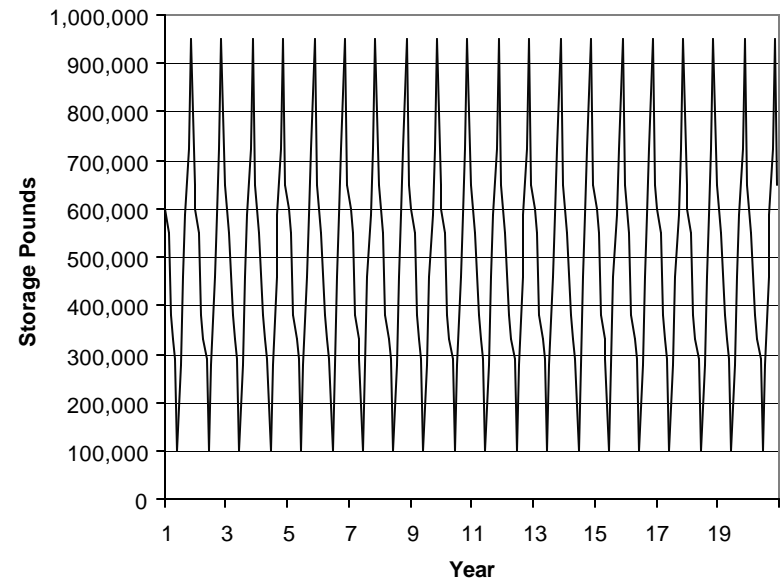
Predicted Inventory for Small Scale Newport Processor

Inputs per Year (pounds)



Salmon	Dungeness Crab	Groundfish	Shrimp
Sablefish	Albacore	FAS Salmon	Other
Sardine	P. Whiting	Tuna loins	0
0	Whole tuna	0	0
0	0	0	0

Inventory by Month (pounds)



Cost and Dimensions for Small Scale Newport Processor

SUMMARY RESULTS FROM SIMULATION

	Height	Floor Area
Building Dimensions	14	8,078

	Predicted	Low Estimate	High Estimate
Building Capital Cost	\$706,760	\$569,445	\$846,831
Other Capital Cost	\$56,527	\$55,375	\$57,680
Total Capital Cost	\$763,287	\$624,819	\$904,511

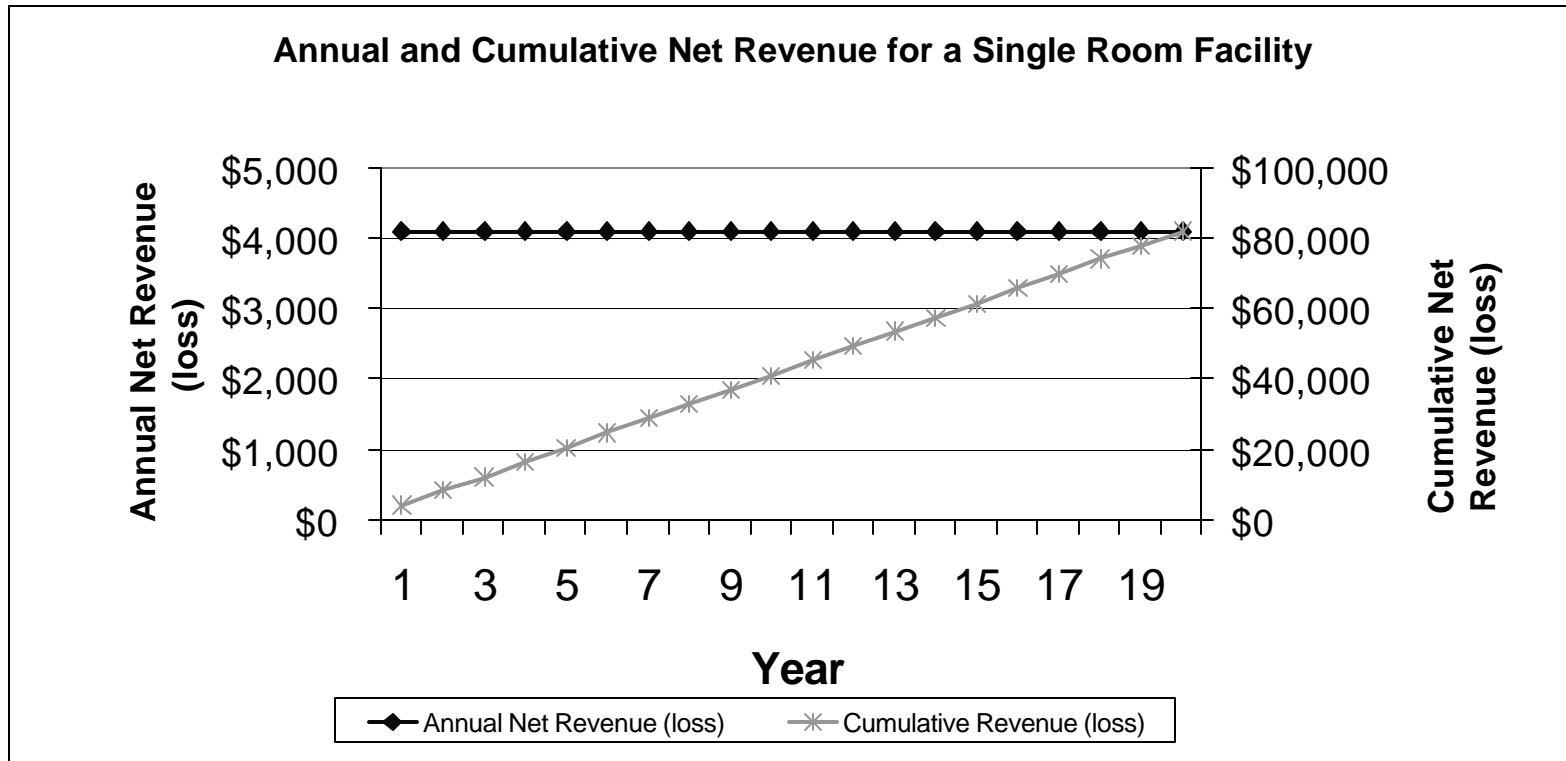
Duration of Loan repayment (years)	Loan percentage Rate	Annual loan payment of total predicted capital cost
30	0	(\$58,450.58)

Annual Cost of Refrigeration Energy	(\$12,967.88)
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Annual Labor Cost	(\$19,800.00)
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Annual Misc. Costs	(\$39,306.90)
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Predicted Revenue (loss) for Small Scale Newport Processor



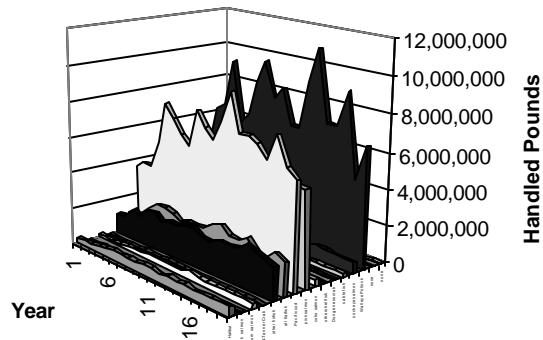
Exploratory Scenario for a Kodiak Cold Store

Several parties have expressed some interest in developing a facility in the town of Kodiak.

This scenario is used to explore the potential for such a facility

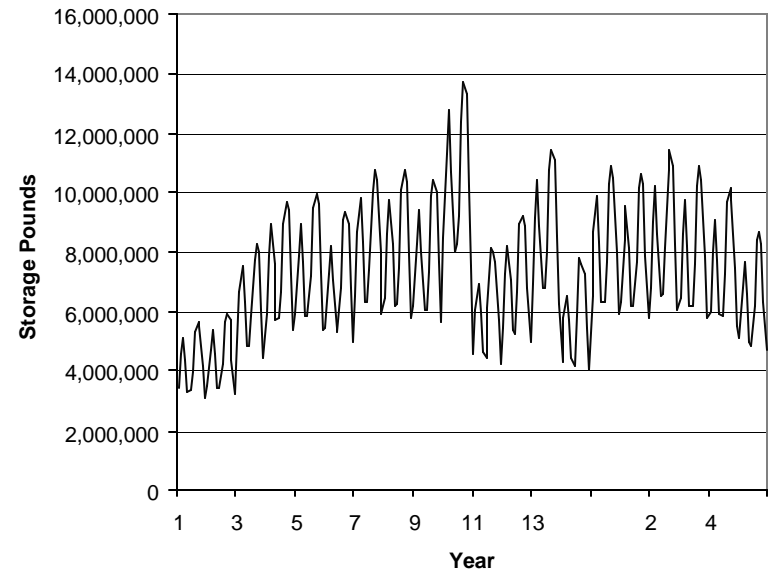
Predicted Inventory for Kodiak Cold Store

Inputs per Year (pounds)



- | | | |
|----------------------|-------------------|----------------|
| ■ Halibut | ■ chinook salmon | □ chum salmon |
| ■ King & Tanner Crab | ■ other finfish | ■ all flatfish |
| □ Pacific cod | □ pink salmon | □ coho salmon |
| ■ other shellfish | ■ Dungeness crab | □ sablefish |
| ■ sockeye salmon | ■ Walleye Pollock | □ none |
| □ none | | |

Inventory by Month (pounds)



Cost and Dimensions for a Cold Store in Kodiak

SUMMARY RESULTS FROM SIMULATION

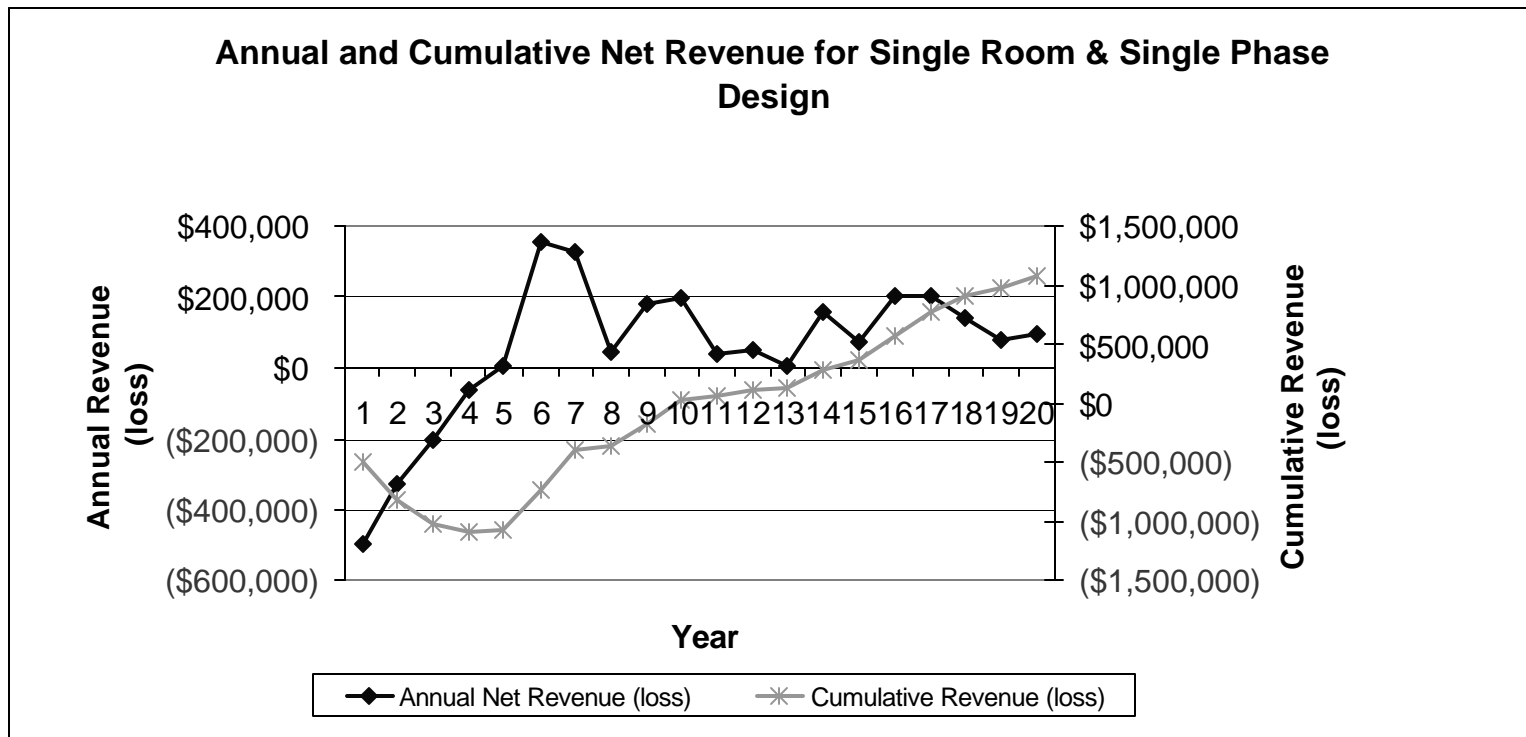
	Height	Floor Area
Building Dimensions	\$30	\$45,384

	Predicted	Low Estimate	High Estimate
Building Capital Cost	\$4,089,738	\$2,553,719	\$5,275,197
Other Capital Cost	\$1,570,811	\$1,389,242	\$2,136,232
Total Capital Cost	\$5,660,549	\$3,942,961	\$7,411,429

	Loan percentage Rate	Annual loan payment of total predicted capital cost
Duration of Loan repayment (years)	0.06	-\$518,059

Annual Cost of Refrigeration Energy	-\$61,409
Annual Labor Cost	-\$147,500
Annual Misc. Costs	\$556,257

Predicted Revenue (loss) for a Kodiak Cold Store



Conclusions